

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 28 OCT 2005

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Applicant's or agent's file reference D-03006 PCT		<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/EP2004/007988		International filing date (day/month/year) 16.07.2004		Priority date (day/month/year) 17.07.2003
International Patent Classification (IPC) or national classification and IPC C01F7/36				
Applicant SASOL GERMANY GMBH ET AL.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> sent to the applicant and to the International Bureau a total of sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in Item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  08.03.2005		Date of completion of this report  28.10.2005		
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer  Schut, R  Telephone No. +31 70 340-		



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PCT/EP2004/007988

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-8 as originally filed

**Claims, Numbers**

1-13 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages.
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	4-7
	No: Claims	1-3,8-13
Inventive step (IS)	Yes: Claims	
	No: Claims	1-13
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

The following documents are mentioned for the first time in this written opinion; the numbering will be adhered to in the rest of the procedure:

- D1: NL 273 221 A (ENGELHARD INDUSTRIES, INC.) 10 September 1964
- D2: POUSKOULELI G: "METALLOORGANIC COMPOUNDS AS PRECERAMIC MATERIALS II. OXIDE CERAMICS" CERAMICS INTERNATIONAL, ELSEVIER APPLIED SCIENCE PUBL, BARKING, ESSEX, GB, vol. 15, no. 5, January 1989 (1989-01), pages 255-270, XP000103795 ISSN: 0272-8842
- D3: SHARMA P K ET AL: "A critical role of pH in the colloidal synthesis and phase transformation of nano size alpha-Al<sub>2</sub>O<sub>3</sub> with high surface area" JOURNAL OF THE EUROPEAN CERAMIC SOCIETY, ELSEVIER SCIENCE PUBLISHERS, BARKING, ESSEX, GB, vol. 23, no. 5, April 2003 (2003-04), pages 659-666, XP004400353 ISSN: 0955-2219
- D4: PH. COLOMBAN: "Structure of oxide gels and glasses by infrared and raman scattering. Part 1 Alumina" JOURNAL OF MATERIALS SCIENCE, vol. 24, 1989, pages 3002-3010, XP002328282
- D5: WO 96/34829 A (INSTITUT FUER NEUE MATERIALIEN GEMEINNUETZIGE GMBH; BURGARD, DETLEF; N) 7 November 1996
- D6: WO 95/12547 A (RWE-DEA AKTIENGESSELLSCHAFT FUER MINERALOEL UND CHEM; NOWECK, KLAUS; SC) 11 May 1995
- D7: DE-A-19836821 (RWE-DEA AG für Mineraloel und Chemie) 24/02/2000

**1) Novelty**

1a) D1 (see; claim 5 and page 4, lines 4-17) discloses a process for preparing boehmitic aluminas by hydrolysing aluminium alcoholates in an aqueous, alkaline solution at a pH from about 8 to 9.5 in the presence of a polycarboxylic acid. The polycarboxylic acid is present in an amount of 0.5 to 3 wt.% based on the amount of Al<sub>2</sub>O<sub>3</sub>.

The subject matter of independent process claim 1, independent product claim 8 and independent use claim 13 are not novel in view of D1 (Art. 33(2) PCT).

1b)D7 (see;claims 4 and 8 to 12) discloses alumina, which has been calcined at 1200°C and having a pore volume of above 0,5 ml/g, pore radii from 8 to 100 nm and a surface area above 20 m<sup>2</sup>/g. The subject matter of independent claim 11 is not novel as the product of D7 has the technical features of claim 11 and would appear therefore to be indistinguishable from the products claimed in claim 11 (Art.33(2) PCT).

1c)D6 (see; table 1) discloses nano size boehmite particles, which are dispersible in water. The subject matter of claim 12 is not novel as the technical features of the product of claim 12 are known from D6 and the products of D6 appear to be indistinguishable from the product claimed in claim 12 (Art.33(2) PCT).

**Dependent claims**

1d)Dependent claims 2,3, 9 and 10 are also not novel in view of D1 as the technical features of those claims appear to be explicitly and/or implicitly disclosed by D1 (see paragraph 1a above).

1e)The subject matter of dependent claims 4 to 7 has not been disclosed in D1 in combination with the subject matter of claim 1 and is therefore novel (Art.33(2) PCT).

**Inventive step**

2a1)D1 (see D1;page 1, line 9 to page 2, line 9 and page 3, lines 7-9) discloses, that boehmite is the preferred material for application in catalysts. The boehmite was prepared by hydrolysis of aluminium alcoholates at pH 8-9.5 in the presence of polycarboxylic acids. The polycarboxylic acids prevented the formation of undesired alumina trihydrate.

2a2)D2 (see;page 261) discloses, that hydrolysis of aluminium alcoholates at high temperature (80°C) leads to boehmite formation and at low temperatures will lead via pseudoboehmite to bayerite formation (i.e., alumina trihydrate).

2a2)D3 (see;abstract) discloses a process for the synthesis of nano size alpha alumina by hydrolysing aluminium alcoholates at high as well as at low pH. The powders obtained at high pH transform via boehmite into alpha alumina, whereas the powders obtained at low pH transform via gamma alumina into alpha alumina.

2a2)D4 (see; page 2002, paragraph 2.1.2) discloses a process for making alumina particles/powder by hydrolysing aluminium alcoholates by adding  $\text{NH}_4\text{OH}$  or acid addition. It was stated, that powders obtained at  $\text{pH}=9$  completely converted into alpha alumina above  $1300^\circ\text{C}$ , whereas powders obtained at  $\text{pH}=2$  started to convert into alpha alumina below  $1050^\circ\text{C}$ .

2b)D5 (claim 12 and page 9, line 31 to page 11, line 36) discloses the advantageous use of surface blocking compounds such as (poly)carboxylic acids, carbonylcarboxylic acids and aminoacids in a process for producing nanometer sized particles like for example boehmite. The surface blocking compounds are assumed to prevent particle growth and agglomeration of the formed particles. This process comprises hydrolysing a precursor, such as aluminium alcoholates, which can be carried out at low pH or at high pH.

2c)A man skilled in the art would in view of the prior art represented by D1 to D5 as a design option modify the process of D1 by working at higher temperatures and use the compounds known from D5 in order to prevent agglomeration and particle growth to take place.

The technical features of dependent claim 4 is therefore considered to represent obvious design options available to the man skilled in the art (Art.33(3) PCT).

2d)The technical features of dependent claims 5 to 7 are known and/or obvious from D6 (see;pages 5 to 9, tables 2 and 3).

3)D6 (see; claim 8, page 6, last paragraph and page 8) discloses a process for obtaining nano size boehmite by adding polymerization inhibitors in the hydrolysis step of aluminium alcoholates, which preferably takes place at temperatures of  $60$  to  $100^\circ\text{C}$ . The polymerization inhibitors prevent linking up of the  $\text{Al-OH}$ -groups. One type of polymerization inhibitors disclosed by D6 are organic acids comprising an amino group. The product obtained in D6 is suitable for use in catalysts.

3a)D5 (see D5; page 6, lines 16-26 and claim 9) discloses the addition of surface blocking compounds such as aminoacids in the hydrolysis step of a process for making nano size particles such as  $\text{AlO}(\text{OH})$ .

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3b) From D5 and D6 it is known, that it is advantageous to add aminoacids to the hydrolysis step of aluminium alcoholates. D5 discloses, that the hydrolysis can be carried out at high as well as low pH. D1 , D2, D3 and D4 each disclose, that it is better to work at high pH in the hydrolysis step if boehmite is to be obtained.

3c) A man skilled in the art would in view of the prior art represented by D1 to D6 seriously consider adding aminoacids in the hydrolysis step of aluminium alcoholates taking place at a pH > 8.5. The subject matter of independent claims 1, 8 and 13 does therefore not satisfy the requirements for the presence of an inventive step (Art.33(3) PCT).

3d) The subject matter of claim 12 does also not satisfy the requirements for the presence of an inventive step as it is common practise to calcine boehmite in order to obtain alpha alumina.